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APPLICANT : HITACHI LTD;

INVENTOR : MURANAKA TADASHI;

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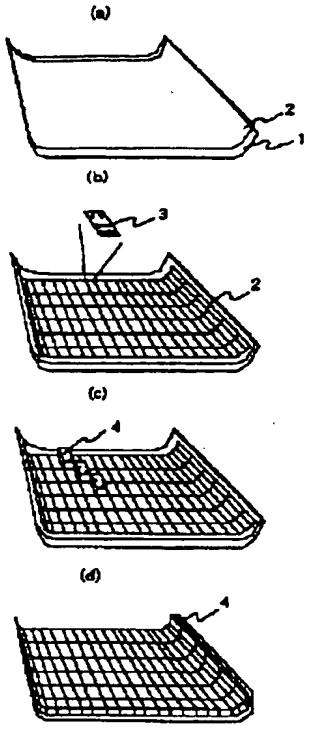
TITLE : SECONDARY BATTERY SYSTEM, SECONDARY BATTERY, SYSTEM USING SECONDARY BATTERY



ABSTRACT : PROBLEM TO BE SOLVED: To provide a compact and lightweight secondary battery system.

SOLUTION: A secondary battery system is equipped with unit cells 4 having positive electrode terminals and negative electrode terminals, and a board 2 on the surface of which respective circuit patterns 3, in which respective contacts to be connected to respective terminals and respective wirings wired from the respective contacts are wired and the adjoining respective wirings are mutually connected in plural sections dividing formed into a predetermined dimension matching the dimension and the shape of the unit cell 4, are formed. On the respective circuit patterns 3 plural unit cells 4 are provided side by side so that respective terminals and respective contacts abut mutually to form a battery set, and the same is incorporated into the housing 1 of a system using a secondary battery.

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(71)Applicant : HITACHI LTD

(72)Inventor : IGAWA MICHIKO
SHIRAO HIDETO
YOSHIKAWA MASANORI
MURANAKA TADASHI

(54) SECONDARY BATTERY SYSTEM, SECONDARY BATTERY, SYSTEM USING SECONDARY BATTERY

(57)Abstract:

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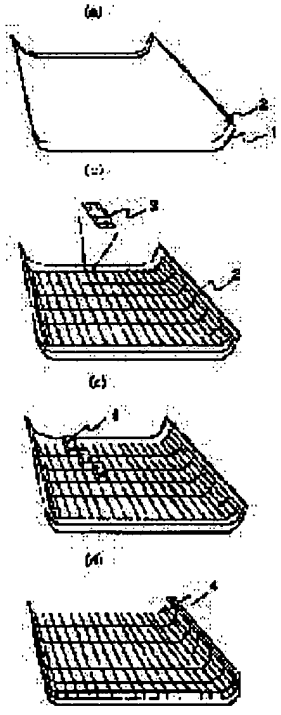

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(71)出願人　000005108
株式会社日立製作所
東京都千代田区神田駿河台四丁目６番地

(72)発明者　井川　享子
茨城県日立市大みか町七丁目１番１号　株式会社日立製作所日立研究所内

(72)発明者　白生　秀人
茨城県日立市大みか町七丁目１番１号　株式会社日立製作所日立研究所内

(72)発明者　吉川　正則
茨城県日立市大みか町七丁目１番１号　株式会社日立製作所日立研究所内

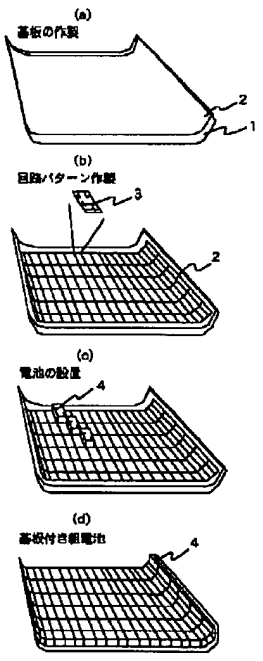
(74)代理人　弁理士　高田　幸彦　（外１名）

最終頁に続く

(54)【発明の名称】　二次電池システム及び二次電池及び二次電池使用システム

(57)【要約】
【課題】コンパクトで軽量な二次電池システムを提供する。
【解決手段】二次電池システムは、正極端子と負極端子を有する単位電池４と、単位電池４の寸法形状に合わせて所定寸法に分割した複数個の区画に、各端子に接続するための各接点と該各接点から配設した各配線とが配設され隣接する該各配線同士が結線された、個々の回路パターン３を表面に形成している基板２とを有し、該各回路パターン３上に各端子と各接点を当接して複数個の単位電池４を並設して組電池化したものであって、二次電池使用システムの筐体１に組み込まれているものである。

図 1



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【特許請求の範囲】

【請求項１】正極端子と負極端子を有する二次電池と、該二次電池の寸法形状に合わせて所定寸法に分割した複数個の区画に、前記正極端子と前記負極端子に直列接続するための直列用接点と該直列用接点から配設した直列用配線とが配設され、隣接する該直列用配線同士が結線された、個々の回路パターンを表面に形成している基板とを備え、

前記基板上の前記各回路パターンに、前記各端子と前記各接点を当接して複数個の前記二次電池を並設し、直列電源の組電池を構成したことを特徴とする二次電池システム。

【請求項２】正極端子と負極端子を有する二次電池と、該二次電池の寸法形状に合わせて所定寸法に分割した複数個の区画に、前記正極端子と前記負極端子に並列接続するための並列用接点と該並列用接点から配設した並列用配線とが配設され、隣接する該並列用配線同士が結線された、個々の回路パターンを表面に形成している基板とを備え、

前記基板上の前記各回路パターンに、前記各端子と前記各接点を当接して複数個の前記二次電池を並設し、並列電源の組電池を構成したことを特徴とする二次電池システム。

【請求項３】直列電源用の正極端子及び負極端子と並列電源用の正極端子及び負極端子の４端子を同一収納体に有する二次電池と、

該二次電池の寸法形状に合わせて所定寸法に分割した複数個の区画に、前記各正極端子と前記各負極端子に直列接続及び並列接続するための直列用接点及び並列用接点と、該各接点から配設した直列用配線及び並列用配線とが配設され、隣接する該直列用配線同士及び該並列用配線同士が結線された、個々の回路パターンを表面に形成している基板とを備え、

前記基板上の前記各回路パターンに、前記各端子と前記各接点を当接して複数個の前記二次電池を並設し、直列電源及び並列電源の組電池を構成したことを特徴とする二次電池システム。

【請求項４】請求項１または請求項２または請求項３において、前記各回路パターンのうちの少なくとも１つの当該回路パターンは、前記直列用接点または前記並列用接点を介して、前記二次電池の電気信号を検出する信号検出手段を有することを特徴とする二次電池システム。

【請求項５】請求項３において、前記基板は、前記直列電源用の正極端子及び負極端子と前記直列用接点とを直列接続した直列電源か前記並列電源用の正極端子及び負極端子と前記並列用接点とを並列接続した並列電源を選択するための切替手段を有することを特徴とする二次電池システム。

【請求項６】直列電源と並列電源とに対応可能な２組の正極端子と負極端子の４端子を同一収納体に有する「４

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端子構造の単位電池」であることを特徴とする二次電池。

【請求項７】請求項１ないし請求項５のいずれか１項記載の二次電池システムを当該二次電池使用システムの筐体等に組み込んだことを特徴とする二次電池使用システム。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、二次電池及び二次電池システム及び二次電池使用システムに係り、特に、二次電池システムと二次電池使用システムの筐体との構造に関する。

【０００２】

【従来の技術】近年、二次電池は、パソコンや携帯電話などの電源として、あるいは電気自動車や電力貯蔵用の電源として、なくてはならない重要な構成要素の一つとなっていて、携帯型コンピュータ（ペンコンピュータと呼ばれるものも含む）や携帯情報端末（Personal Digital Assistant、あるいはPersonal Intelligent Communicator、あるいはハンドヘルド・コミュニケータ）といった移動体通信(モービルコンピューティング)において、特に、小型化や軽量化が要求される。しかし、液晶表示パネルのバックライトや描画制御によって消費される電力が高いことや二次電池の容量が現状ではまだ不十分であることなどの点から、システムのコンパクト化が難しい状況にある。

【０００３】さらに、地球環境問題の高まりとともに排ガスや騒音を出さない電気自動車が関心を集めている。しかし、車体に対して電池の占める体積が極めて大きいことや電池の総重量が著しく重いなどから、車内のスペースが狭い、車体の安定性が悪い、加速性が悪いなどの難点が生じている。これらもまた、二次電池のエネルギ密度が低いことが原因となっている。

【０００４】二次電池を用いたシステムの小型化、軽量化を実現させるには、二次電池のエネルギ密度を現在の５～１０倍程度に増加させる必要がある。これは、現状では不可能である。従って、現状のエネルギ密度の二次電池を用いてシステムの小型化、軽量化を図るために、システム内のデッドスペースを有効に利用した二次電池の形状及び回路設計が求められている。そして、デッドスペースの有効利用に関する従来技術として、例えば、特開平2－111204号公報に、フレキシブルなシート状リチウム二次電池を用いる四輪駆動電気自動車が開示されている。

【０００５】

【発明が解決しようとする課題】フレキシブルなシート状リチウム二次電池を使用すれば、自動車のボディの壁面や空いたスペースに簡便に装備できるので、乗車スペースや荷台スペースが十分に確保できる上、軽量化もできる。携帯型コンピュータや携帯情報端末等の二次電池

を用いるシステムにおいても、コンパクト化、軽量化が期待できる。しかし、フレキシブルな電池は、一般に固体電解質を用いるので、エネルギ密度が低く、大電流で充放電することができない。また、反応活性の高いアルカリ金属が原子状あるいはイオン状で反応に関与することから耐衝撃性や耐破壊性に劣り、安全性の面にも課題がある。更に、単電池のエネルギ密度が小さいので、システムが電気自動車のように大きい場合、直並列の数が膨大となり、回路設計の点で煩雑である。

【０００６】このように、二次電池を用いるシステムのコンパクト化、軽量化を図るのに有効な方法はあまり見出されていない。したがって、本発明の目的は、コンパクト化、軽量化を実現させる二次電池及び二次電池システム及び二次電池使用システムを提供するにある。

【０００７】

【課題を解決するための手段】上記目的を達成する二次電池システムは、正極端子と負極端子を有する二次電池と、該二次電池の寸法形状に合わせて所定寸法に分割した複数個の区画に、前記正極端子と前記負極端子に直列接続するための直列用接点と該直列用接点から配設した直列用配線とが配設され、隣接する該直列用配線同士が結線された、個々の回路パターンを表面に形成している基板とを備え、前記基板上の前記各回路パターンに、前記各端子と前記各接点を当接して複数個の前記二次電池を並設し直列電源の組電池を構成したものである。

【０００８】また、正極端子と負極端子を有する二次電池と、該二次電池の寸法形状に合わせて所定寸法に分割した複数個の区画に、前記正極端子と前記負極端子に並列接続するための並列用接点と該並列用接点から配設した並列用配線とが配設され、隣接する該並列用配線同士が結線された、個々の回路パターンを表面に形成している基板とを備え、前記基板上の前記各回路パターンに、前記各端子と前記各接点を当接して複数個の前記二次電池を並設し、並列電源の組電池を構成した二次電池システムでも良い。

【０００９】さらに、直列電源用の正極端子及び負極端子と並列電源用の正極端子及び負極端子の４端子を同一収納体に有する二次電池と、該二次電池の寸法形状に合わせて所定寸法に分割した複数個の区画に、前記各正極端子と前記各負極端子に直列接続及び並列接続するための直列用接点及び並列用接点と、該各接点から配設した直列用配線及び並列用配線とが配設され、隣接する該直列用配線同士及び該並列用配線同士が結線された、個々の回路パターンを表面に形成している基板とを備え、前記基板上の前記各回路パターンに、前記各端子と前記各接点を当接して複数個の前記二次電池を並設し、直列電源及び並列電源の組電池を構成した二次電池システムであっても良い。

【００１０】一方、本発明による二次電池の特徴は、直列電源と並列電源とに対応可能な２組の正極端子と負極端子の４端子を同一収納体に有する４端子構造の単位電池にある。そして、本発明による二次電池使用システムの特徴は、請求項１ないし請求項５のいずれか１項記載の二次電池システムを当該二次電池使用システムの筐体等に組み込んだことにある。

【００１１】本発明によれば、二次電池及び二次電池システム及び二次電池使用システムの一体化が可能となり、コンパクト化や軽量化が図られる。

【００１２】

【発明の実施の形態】以下、本発明の実施の形態について、図面を参照し説明する。図１は、本発明による一実施例の二次電池システムを示す図である。図２は、図１の二次電池システムを構成するための一実施例の回路パターンを示す図である。図３は、本発明による一実施例の二次電池を示す図である。本発明について図１～図３で示す設計手順から説明する。

【００１３】二次電池使用システムにおける、二次電池と二次電池システム及びその周辺部の一貫専用化設計(一体化設計)は、以下のように行なわれる。まず、図１(a)に示す手順において、二次電池システムが装備され得る空間を有している部品として、二次電池使用システムの外装ケースの一部としての筐体１を選定する。そして、該筐体１の寸法形状から、二次電池システムを搭載する基板２の形状を決定する。基板２は、一個の二次電池としての単位電池４を複数個搭載し、二次電池システムを形作るための取付体(の全体)である。

【００１４】次に、図１(b)に示す手順において、図３に示すような単位電池４の、大きさ寸法を決定する。個々の単位電池４の大きさは筐体１の寸法形状から設計する。例えば、複雑な形状の筐体である場合には、単位電池の大きさは小さいものを使用した方が基板２の形状とのずれがなく、パッキング密度の高い(スペース効率の良い)配置ができるので望ましいと言える。また、単位電池の大きさは、基板２の形状から判断して、単位電池４の配設スペースに無駄のない配置が可能となるように計算により求める。即ち、「二次電池システムとしての組電池」の単位面積当たりのエネルギ密度が最大となるように単位電池４の大きさを算出する。

【００１５】さらに、二次電池使用システムが必要とする容量から単位電池４の厚みを決定する。そして、組電池の単位体積当たりのエネルギ密度が最大となる単位電池４の厚みを算出し、該エネルギ密度からの算出厚みと前記容量からの算出厚みとの間に大きなずれが生じる場合には、例えば、二次電池システムとしての組電池を二層に積層配置する構造に設計する。

【００１６】また更に、図１(b)に示す手順において、基板２に、複数個の単位電池４を搭載するために、該単位電池４の寸法形状に合わせて所定寸法に整然と分割した複数個の区画に、個々の回路パターン３を設定する。すなわち、基板２は、図２に示すように、単位電池４が

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有する２組の正極端子と負極端子(直列用正極端子９,直列用負極端子１０,並列用正極端子１１,並列用負極端子１２)を 電気的に接続するための接点(直列用接点５,並列用接点６)と、「二次電池使用システムの回路設計に基づいて、単位電池４を直列に接続した直列電源または並列に接続した並列電源」として用いるための配線とからなる回路パターン３を、複数個有する。

【００１７】換言すれば、基板２には、二次電池の寸法形状に合わせて所定寸法に整然と分割した複数個の区画に、各正極端子と各負極端子に直列接続及び並列接続するための直列用接点及び並列用接点と該各接点から配設した直列用配線および並列用配線とが配設され、隣接する該直列用配線同士及び該並列用配線同士が結線された、個々の回路パターンが表面に形成される。従って、個々の単位電池４と個々の回路パターン３とは対応して設定される。しかし、必ずしも１対１の関係でなくても可である。

【００１８】上記電池電源用の配線は、図２に示すように、直列用接点５を介して各単位電池４を直列に結線するための直列用配線18と、並列用接点６を介して各単位電池４を並列に結線するための並列用配線19と、単位電池４の内部回路の電圧、すなわち、個々の単位電池４の電圧をモニタするための信号線８とからなり、それぞれはシールドされている。そして、該信号線８から過充電や過放電を防止するために設けられている安全保護回路(図示してない)へ電圧情報などが伝達される。さらに、基板２の外周端部には、直列または並列に接続された単位電池４の電源を集合する集電回路(図示してない)が必要に応じて設定される。

【００１９】以上を纏めれば、基板への単位電池の配置にあたっては、ＣＡＤなどの設計手法(シミュレーション)を用いて、単位面積当たりのエネルギ密度、ならびに単位体積当たりのエネルギ密度を最大にする単位電池の大きさを求め、そして、該単位電池の寸法形状に合わせて所定寸法に整然と分割した回路パターンの１区画を決めるものである。また、必要に応じて、積層可能な構造の単位電池を基板に多層積層した構造の二次電池システムとすることにより、エネルギ密度の向上を図るものである。

【００２０】そして、図1(c),(d)に示す手順において、基板２上に形成した複数個の回路パターン３に、各端子と前記各接点が当接するようにして複数個の単位電池４を設定し、二次電池と二次電池システム及びその周辺部の設計、すなわち、二次電池使用システムの設計を完了する。これらの設計手順によって、極めて柔軟性のある回路設計が可能であり、加えて、システムのデザインを優先したコンパクトで軽量なシステム設計ができる。

【００２１】さらに、本発明による構成とその動作について追記する。上記のように、二次電池システムは、複

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数個の単位電池４を直並列用配線を備えた図２に示すような回路パターン３に複数個隣接配置して組電池化したものである。そして、基板２に形成される回路パターン３は、二次電池としての単位電池４の直列用正極端子９,直列用負極端子１０, 並列用正極端子１１,並列用負極端子１２を接続するための接点として、各々が２個づつの直列用接点５と並列用接点６との２種類を備える。この２種類の接点は、直列または並列を選択することを目的とし、一方は直列電源を構成するために、他方は並列電源を構成するために、直列または並列に接続可能の構成となっている。

【００２２】この直並列電源の組合せは、単位電池４の容量と二次電池使用システムの消費電力とによって決定される。すなわち、直並列の組合せに応じて、基板２上で直並列の切り替えが行えるように、基板２は直並列電源を選択するための切替手段を内蔵する。 切替手段としてのスイッチ７は基板２(単位電池４が当接する面の背面側)に設けられるが、 例えば、単位電池４に設けて外部で切り替える構成とすることもできる。

【００２３】基板２上に設ける構成であれば、どのような直並列の組合せにも対応することができ、すなわち、二次電池システム(及び二次電池使用システム)が必要とする電圧及び容量から直並列の組合せを設計し、その後、基板２上で、直列または並列の切り替えを選択できるので、設計自由度が向上し望ましいと言える。

【００２４】一方、回路パターン３は、基板２上の単位電池４の電圧をモニタするための信号検出手段としての信号線８を備えているので、例えば、充電時、瞬時に電流を遮断した場合に、その時の単位電池４の回路電圧を該信号線８から読み取ることができる。即ち、回路電圧信号は、制御コンピュータ(図示していない)に伝送されて利用される。

【００２５】例えば、制御コンピュータでは、個々の単位電池４の回路電圧信号から単位電池４の充電状態を把握し、マッピングすることができる。また、回路パターン３上の配線回路は複雑になるが、 回路電圧信号と制御コンピュータとで「異常な単位電池」を検出して、 該異常単位電池のみを直列電源や並列電源の電源回路から切り離すこともできる。

【００２６】さらに、基板２内に過充電あるいは過放電を防止するためのＦＥＴ遮断用の保護手段としての安全保護回路を備えることもできる。この場合に、単位電池４の所定個数毎(電池ブロック毎)に１個の安全保護回路を備え、電池ブロック毎に回路電圧信号を纏めれば、信号線８がブロック毎に一本に纏められるので、二次電池システム(及び二次電池使用システム)のコンパクト化に結び付けることができる。

【００２７】ところで、 本実施例に示す二次電池は、直列用正極端子９, 直列用負極端子１０,並列用正極端子１１,並列用負極端子１２を有する、直列電源と並列

電源とに対応可能な２組の正極端子と負極端子の４端子を同一収納体に有する単位電池である。換言すれば、本実施例では、直列電源または並列電源への切り替え対応を可能とする２組の正極端子と負極端子の４端子を同一収納体(同一セル)に有する「４端子構造の単位電池」を採用した例が示されている。これは前述のように、切替手段としてのスイッチ７と共に採用し設計自由度を向上するものであるが、勿論、切替手段がなくて、一般に使用されている正極端子と負極端子の２端子からなる二次電池としての単位電池４と基板２との組み合わせでも可である。

【００２８】即ち、本実施例では、単位電池の寸法形状を筐体等が有する電池収納許容空間の寸法形状に基づいて決定するが、該決定寸法形状は必ずしも専用単位電池の製作に結び付くものではなく、現有の汎用単位電池が利用される場合もある。このような場合の対応について、図４～図５で説明する。

【００２９】図４は、本発明による他の実施例の回路パターンを示す図である。複数個の二次電池を並設して、二次電池システムとしての直列電源の組電池を構成するために隣接する回路パターンを示している。図５は、本発明による別の実施例の回路パターンを示す図である。二次電池システムとしての並列電源の組電池を構成するために隣接する回路パターンを示している。

【００３０】図４は、直列電源用の個々の回路パターン３の、隣接する回路パターン３ａと回路パターン３ｂ(一部)を示している。回路パターン３ａ，３ｂは、共に二次電池の電気信号を検出する信号検出手段としての信号線８ａ，８ｂを有している。信号線８ａは直列用接点５ａと接続しているが、信号線８ｂは直列用接点５ｂに接続しておらず、信号線８ｂは回路パターン３ａで検出した電気信号を伝送する配線である。すなわち、所定個数の単位電池毎(電池ブロック毎)に、電気信号を検出する場合である。なお、回路パターン上の信号線回路は輻輳するが、電気信号を検出する単位電池個数を増やすことは可能である。

【００３１】また、図５において、並列電源用の個々の回路パターン３のうちの、一部の隣接する回路パターン３ｃと回路パターン３ｄが示されている。回路パターン３ｃは信号線８を有していないが、回路パターン３ｄは信号線８を有している。並列電源の場合は、このような構成として電池ブロック毎に電気信号を検出するものである。上記のような回路パターン３を用いて、直列電源または並列電源の組電池を構成することができ、正極端子と負極端子の２端子からなる汎用単位電池に関する利用が為される。

【００３２】以上を纏めれば、次の通りである。すなわち、本発明の特徴は、０.５(Ｗｈ)以上～５０(ｋＷｈ)以下の容量を有する熱源、動力、制御回路、駆動回路、ＬＳＩ、ＩＣ、表示素子のうち少なくとも１つあるいはこれらの複数の組合せを含む二次電池使用システムにおいて、二次電池及び二次電池システムを二次電池使用システム(筐体など)に 一体化(専用化)する点にある。 また、本発明による二次電池使用システムは、筐体が複雑な寸法形状であっても、適切に簡単に筐体と二次電池システム(含む二次電池)を一体化することができる点にもある。

【００３３】そして本発明によって、二次電池使用システムの筐体と二次電池及び二次電池システムとを一体化させることにより、筐体(または筐体の一部または筐体内部)の空いているスペース(電池収納許容空間)を有効利用することができるので、二次電池使用システムのコンパクト化や軽量化が図られる。 なお、０.５(Ｗｈ)以上～５０(ｋＷｈ)以下の容量範囲とは、この範囲の二次電池使用システムとしての対象製品のスペース有効利用のニーズが高いからである。なお、上記の筐体または筐体の一部または筐体内部の電池収納許容空間を「筐体等」と呼称する。

【００３４】また、本発明による二次電池システムは、液晶ディスプレイ、多層配線基板、ＰＣＭＣＩＡカード（ＰＣカード）、音声カード、モデム、携帯電話、ＦＡＸ、電池用ＩＣ、電気自動車、エレベータ、電車、非常用電源のうち少なくとも１つあるいはこれらの複数の組合せに適用される。さらに、複数個の単位電池が接続された二次電池システムおよびこれを用いた二次電池使用システムにおいて、該単位電池が配置される該基板は、二次電池使用システムの筐体等とほぼ同じ寸法形状を有し、かつ該筐体等と一体化されている。

【００３５】またさらに、複数個の単位電池が接続された二次電池システムおよびこれを用いた二次電池使用システムにおいて、該単位電池は、該単位電池間の直列または並列を切り替える切替手段を内蔵した基板上に設置されている。すなわち、複数個の単位電池が基板上に接続された二次電池システムおよびこれを用いた二次電池使用システムにおいて、該単位電池は、直列電源と並列電源の２種類の電源に対応可能とするための２種類の正極端子と負極端子を有し、かつ、基板は該２種類のうちのいずれかを選択することにより直列電源または並列電源への切り替えが可能である。

【００３６】さらにまた、複数個の単位電池が基板上に接続された二次電池システムおよびこれを用いた二次電池使用システムにおいて、該基板は、単位電池の回路電圧を検出するための信号検出手段としての信号線を有する、または、該信号検出手段からの電気信号を利用して、過充電あるは過放電を防止するための保護手段を有している。

【００３７】

【実施例】更に、本発明による二次電池及び二次電池システム及び二次電池使用システムについて、前述の図１～図３に示す手順にしたがって具体的に製作実施した例

から説明する。

【００３８】（実施例１）図１(ａ)に示す手順において、５インチの液晶パネルの裏側に２０(Ｗｈ)容量の二次電池システムを搭載した二次電池使用システムを対象として、５インチの液晶パネルのサイズとほぼ同サイズの筐体１を作製した。この筐体１は、二次電池使用システムの外装ケースの一部となるものである。そして、筐体１とほぼ同じ寸法形状の基板２を作製し、基板２の寸法形状から単位体積当たりのエネルギ密度が最大となるようなシミュレーションを実行し、「二次電池としての単位電池４」のサイズを決定した。そして、該サイズの単位電池４を専用に製作した。

【００３９】図１(ｂ)に示す手順において、シミュレーションで得られた単位電池４のサイズに基づいて、基板２を網目状に整然と分割し、分割したそれぞれの部位に回路パターン３を一体形成した。尚、別体の回路パターン３を基板２に固着形成しても可である。図２は回路パターン３の拡大図でもある。回路パターン３が形成された表面側(すなわち、基板２の表面側)には、直列用接点５と並列用接点６があり、各接点５，６には、直列用配線18，並列用配線19が接続され、回路電圧を計測するための信号線８も配設されている。

【００４０】そして図示していないが、隣接する各回路パターン３の各配線18,19同士は、直列または並列に接続されて、直列電源または並列電源の組電池が構成される。一方、回路パターン３の裏面側(すなわち、基板２の裏面側)には、接点５または接点６を選択開閉するためのスライド式のスイッチ７が取り付けられている。

【００４１】図１(ｃ)に示す手順において、基板２に単位電池４を配置固定した。図３は、「本発明による一実施例の二次電池としての単位電池４」の構造図でもある。単位電池４では、単位電池４が回路パターン３と当接する単位電池４の表面の、回路パターン３の直列用接点５と並列用接点６に対応する位置に、直列用正極端子９及び直列用負極端子１０と、並列用正極端子１１及び並列用負極端子１２とが設けられている。したがって、直列用接点５に直列用正極端子９及び直列用負極端子１０が当接し、並列用接点６に並列用正極端子１１及び並列用負極端子１２が当接するようにして、基板２に形成された各回路パターン３に各単位電池４が固定されて、直列電源または並列電源の組電池が構成される。また、必要に応じて積層構造タイプに形成した単位電池４が積層固定される。

【００４２】図１(ｄ)に示す手順において、複数個の回路パターン３に対応した個数の単位電池４を、基板２上に形成した個々の回路パターン３に固着搭載して、二次電池システムを完成した。従って、本発明による一実施例の二次電池システムは、複数個の回路パターン３を有する基板２と、該回路パターン３に固着搭載した複数個の単位電池４とから構成されていると言える。

【００４３】なお、基板２を利用しないで直接筐体１に複数個の回路パターン３をプリント形成するも可であるが、スイッチ７の設置，二次電池システムの強度や信頼性，あるいは二次電池使用システムの組立性などの点から、筐体１とは別体となっている基板２を設けて利用した方が好ましいと言える。回路パターン３を直接筐体１に形成したものであれば、例えば、切り替えのスイッチ７は単位電池４側に設けるなど、スイッチ７を別設定とする必要がある。

【００４４】このように製作した二次電池システム付き筐体１を、５インチの液晶パネルの裏側に設置して一体化し、二次電池使用システムの外装ケース（例えば、蓋ケース)として完成した。本実施例の場合の「二次電池使用システムとしての液晶ディスプレイ」のサイズは、７７.５(㎤)と小さく、厚みは、１(ｃｍ)と薄いものであった。そして、重量は、５０(ｇ)と軽量であった。また、破壊試験による強度は、３５(ｋｇｆ／㎠)であった。

【００４５】（比較例１）５インチの「液晶ディスプレイ」システム内に、容量が７.２(Ｗｈ)で18650サイズの汎用単位電池としての円筒型電池を５本用いて、２１.６(Ｗｈ)容量の二次電池システムとしての電池パックを作製した。この場合の液晶ディスプレイのサイズは、３１０(㎤)と大きく、厚みが４(ｃｍ)と厚かった。重量は５５(ｇ)と重い。また重心が電池パックよりに偏っているため携帯性が悪いものであった。なお、汎用単位電池とは、汎用性を持たせて電池専用メーカが多量に製作している単位電池を指している。

【００４６】（比較例２）５インチの「液晶ディスプレイ」内に、容量が１.８(Ｗｈ)の汎用単位電池としてのフレキシブル電池を１２個用いて、２１.６(Ｗｈ)容量の電池パックを作製した。この場合の液晶ディスプレイのサイズは、１５５(㎤)と大きく、厚みが２(ｃｍ)と厚かった。また、破壊試験による強度は５(ｋｇｆ／㎠)と小さく、弱かった。

【００４７】

【発明の効果】本発明によれば、二次電池及び二次電池システム及び二次電池使用システムを一貫専用化(一体化)することが可能となり、液晶ディスプレイシステム、液晶ディスプレイシステムを用いた携帯情報端末、携帯型コンピュータ、ペンコンピュータ、携帯電話の機能を有するシステム、電気自動車、エレベータ、電車、非常用電源などの二次電池使用システムのコンパクト化、軽量化が図られるという効果ある。

【００４８】また、本発明による二次電池システムは、筐体に応じた寸法形状の基板(含む回路パターン)に単位電池を配設し筐体と一体化したものであるから、二次電池使用システムの形状に容易に合わせられるという設計自由度が発揮され、二次電池システムや二次電池使用システムの組立性が簡便になるという効果もある。

11　　12

【0049】そして、筐体が形成する空間を二次電池システムの組み込み個所として有効に利用することにより、二次電池使用システムのコンパクト化、軽量化が図れる。さらに、使用システムの重心や形状を考慮した設計ができることから、二次電池使用システムの携帯性、快適性が得られる。

【図面の簡単な説明】

【図1】本発明による一実施例の二次電池システムを示す図である。

【図2】図1の二次電池システムを構成するための一実施例の回路パターンを示す図である。

【図3】本発明による一実施例の二次電池を示す図である。

【図4】本発明による他の実施例の回路パターンを示す図である。

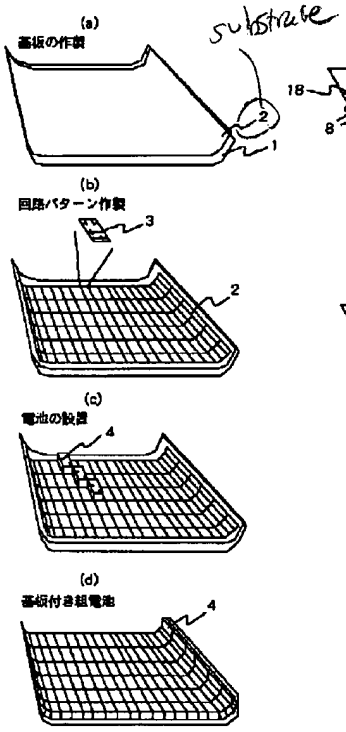
【図5】本発明による別の実施例の回路パターンを示す図である。

【符号の説明】

1…筐体、2…基板、3，3a，3b，3c，3d…回路パターン、4…単位電池、5，5a，5b…直列用接点、6…並列用接点、7…スイッチ、8，8a，8b…信号線、9…直列用正極端子、10…直列用負極端子、11…並列用正極端子、12…並列用負極端子、18…直列用配線、19…並列用配線

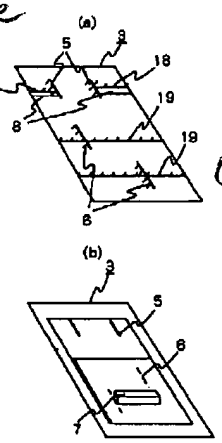
【図1】

図 1



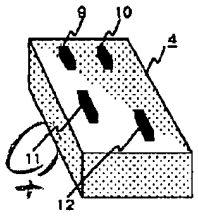
【図2】

図 2



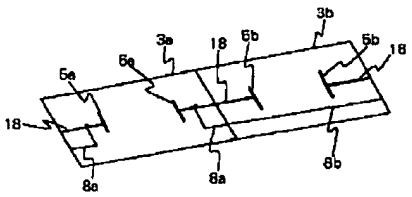
【図3】

図 3



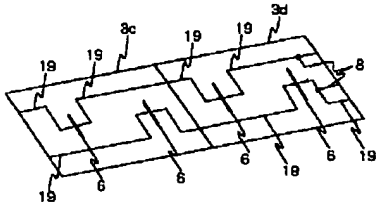
【図4】

図 4



【図5】

図 5



フロントページの続き

(72)発明者　村中　廉
茨城県日立市大みか町七丁目1番1号　株
式会社日立製作所日立研究所内

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The rechargeable battery system which is equipped with the following, installs two or more aforementioned rechargeable batteries for each aforementioned terminal and each aforementioned contact in contact with each aforementioned circuit pattern on the aforementioned substrate, and is characterized by constituting the group cell of an in-series power supply. The rechargeable battery which has a positive-electrode terminal and a negative-electrode terminal. The substrate which forms in a front face each circuit pattern with which the wiring for in-series arranged in the aforementioned positive-electrode terminal and the aforementioned negative-electrode terminal from the contact for in-series for carrying out a series connection and this contact for in-series was arranged by two or more partitions divided into the predetermined size according to the size configuration of this rechargeable battery, and these adjoining wiring for in-series was connected.
[Claim 2] The rechargeable battery system which is equipped with the following, installs two or more aforementioned rechargeable batteries for each aforementioned terminal and each aforementioned contact in contact with each aforementioned circuit pattern on the aforementioned substrate, and is characterized by constituting the group cell of a parallel power supply. The rechargeable battery which has a positive-electrode terminal and a negative-electrode terminal. The substrate which forms in a front face each circuit pattern with which the wiring for parallel arranged in the aforementioned positive-electrode terminal and the aforementioned negative-electrode terminal from the contact for parallel for carrying out parallel connection and this contact for parallel was arranged by two or more partitions divided into the predetermined size according to the size configuration of this rechargeable battery, and these adjoining wiring for parallel was connected.
[Claim 3] The rechargeable battery system which is equipped with the following, installs two or more aforementioned rechargeable batteries for each aforementioned terminal and each aforementioned contact in contact with each aforementioned circuit pattern on the aforementioned substrate, and is characterized by constituting the group cell of an in-series power supply and a parallel power supply. The rechargeable battery which has 4 of the positive-electrode terminal for in-series power supplies, a negative-electrode terminal and the positive-electrode terminal for parallel power supplies, and a negative-electrode terminal terminals on the same receipt object. In two or more partitions divided into the predetermined size according to the size configuration of this rechargeable battery, they are a series connection, a contact for in-series for carrying out parallel connection, and a contact for parallel to each aforementioned positive-electrode terminal and each aforementioned negative-electrode terminal. The substrate which forms in a front face each circuit pattern with which the wiring for in-series and the wiring for parallel which were arranged from each of this contact were arranged, and adjoining these wiring for in-series and these wiring for parallel were connected.
[Claim 4] It is the rechargeable battery system characterized by having a signal-detection means by which at least one circuit pattern concerned in each aforementioned circuit pattern detects the electrical signal of the aforementioned rechargeable battery in a claim 1, a claim 2, or a claim 3 through the aforementioned contact for in-series, or the aforementioned contact for parallel.
[Claim 5] It is the rechargeable battery system characterized by having a change means for choosing the parallel power supply which carried out parallel connection of the positive-electrode terminal for an in-series power supply or the aforementioned parallel power supplies and negative-electrode terminal with which the aforementioned substrate carried out the series connection of the positive-electrode terminal for the aforementioned in-series power supplies and a negative-electrode terminal, and the aforementioned contact for in-series in the claim 3, and the aforementioned contact for parallel.
[Claim 6] The rechargeable battery characterized by being "4 Unit cell of terminal structure" which has 4 of 2 sets of positive-electrode terminals, and a negative-electrode terminal terminals which can respond to an in-series power supply and a parallel power supply on the same receipt object.
[Claim 7] The rechargeable battery use system characterized by building the rechargeable battery system of a claim 1 or a claim 5 given in any 1 term into the case of the rechargeable battery use system concerned etc.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to a rechargeable battery, a rechargeable battery system, and a rechargeable battery use system, and relates to structure with the case of a rechargeable battery system and a rechargeable battery use system especially.
[0002]
[Description of the Prior Art] In recent years, the rechargeable battery is one of the important indispensable components as power supplies, such as a personal computer and a cellular phone, or an electric vehicle and the power supply for power storage, and is set to mobile communications (mobile computing), such as a carried type computer (what is called pen computer is included), and a Personal Digital Assistant (Personal Digital Assistant, Personal Intelligent Communicator, or handheld computer communicator). A miniaturization and lightweight-ization are required especially. However, a difficult situation has miniaturization of a system from points, like that the power consumed by the back light of a liquid crystal display panel or drawing control is high, and the present condition of the capacity of a rechargeable battery is still inadequate.
[0003] Furthermore, the electric vehicle which makes neither exhaust gas nor noise with a rise of global environment problems attracts the interest. However, difficulties, like acceleration nature with the bad stability of the body with a narrow space in the car is bad have arisen from the AUW of that the volume which a cell occupies to the body is very large, or a cell being remarkably heavy etc. It is the cause that these also have the low energy density of a rechargeable battery.
[0004] In order to make the miniaturization of the system using the rechargeable battery, and lightweight-ization realize, it is necessary to make the energy density of a rechargeable battery increase to the about 5 to 10 present times. This is impossible in the present condition. Therefore, in order to attain miniaturization of a system, and lightweight-ization using the rechargeable battery of the present energy density, the configuration and circuit design of a rechargeable battery which used the dead space in a system effectively are called for. And it is conventional technology about a deployment of a dead space. For example, the four-wheel-drive electric vehicle using a flexible sheet-like lithium secondary battery is indicated by JP,2-111204,A.
[0005]
[Problem(s) to be Solved by the Invention] Lightweight-ization can also be performed when an entrainment space and a loading-platform space can fully secure since the wall surface and the vacant space of the body of an automobile can be equipped simple, if a flexible sheet-like lithium secondary battery is used. Also in the system using rechargeable batteries, such as a carried type computer and a Personal Digital Assistant, miniaturization and lightweight-ization are expectable. However, since a solid electrolyte is generally used for a flexible cell, its energy density is low and it cannot carry out charge and discharge by the high current. Moreover, since alkali metal with high reaction activity participates in a reaction by the shape of the shape of an atom, and ion, it is inferior to shock resistance or destruction-proof nature, and there is a technical problem also in the field of safety. Furthermore, like an electric vehicle, since the energy density of a cell is small, when large, the number of serial parallels becomes huge and it is complicated [a system] in respect of a circuit design.
[0006] Thus, the method effective in attaining miniaturization of the system using a rechargeable battery and lightweight-ization is seldom found out. Therefore, the purpose of this invention is to offer the rechargeable battery, rechargeable battery system, and rechargeable battery use system which make miniaturization and lightweight-ization realize.
[0007]
[Means for Solving the Problem] The rechargeable battery with which the rechargeable battery system which attains the above-mentioned purpose has a positive-electrode terminal and a negative-electrode terminal, To two or more partitions divided into the predetermined size according to the size configuration of this rechargeable battery The wiring for in-series arranged from the contact for in-series for carrying out a series connection to the aforementioned positive-electrode terminal and the aforementioned negative-electrode terminal and this contact for in-series is arranged. It has the substrate which forms in a front face each circuit pattern with which these adjoining wiring for in-series was connected, two or more aforementioned rechargeable batteries are installed for each aforementioned terminal and each aforementioned contact in contact with each aforementioned circuit pattern on the aforementioned substrate, and the group cell of an in-series power supply is constituted.
[0008] To moreover, two or more partitions divided into the predetermined size according to the size configuration of the rechargeable battery which has a positive-electrode terminal and a negative-electrode terminal, and this rechargeable battery The wiring for parallel arranged from the contact for parallel for carrying out parallel connection to the aforementioned positive-electrode terminal and the aforementioned negative-electrode terminal and this contact for parallel is arranged. The rechargeable battery system by which these adjoining wiring for parallel was connected and which was equipped with the substrate which forms each circuit pattern in a front face, installed two or more aforementioned rechargeable batteries for each aforementioned terminal and each aforementioned contact in contact with each aforementioned circuit pattern on the aforementioned substrate, and constituted the group cell of a parallel power supply may be used.
[0009] Furthermore, the rechargeable battery which has 4 of the positive-electrode terminal for in-series power supplies, a negative-electrode terminal and the positive-electrode terminal for parallel power supplies, and a negative-electrode terminal terminals on the same receipt object, To two or more partitions divided into the predetermined size according to the size configuration of this rechargeable

battery, at each aforementioned positive-electrode terminal and each aforementioned negative-electrode terminal A series connection, the contact for in-series for carrying out parallel connection, and the contact for parallel, The wiring for in-series and the wiring for parallel which were arranged from each of this contact were arranged, and adjoining these wiring for in-series and these wiring for parallel were connected. You may be the rechargeable battery system which was equipped with the substrate which forms each circuit pattern in a front face, installed two or more aforementioned rechargeable batteries for each aforementioned terminal and each aforementioned contact in contact with each aforementioned circuit pattern on the aforementioned substrate, and constituted the group cell of an in-series power supply and a parallel power supply.

[0010] On the other hand, the feature of the rechargeable battery by this invention is in the unit cell of 4 terminal structures of having 4 of 2 sets of positive-electrode terminals, and a negative-electrode terminal terminals which can respond to an in-series power supply and a parallel power supply on the same receipt object. And the rechargeable battery use system feature by this invention is to have built the rechargeable battery system of a claim 1 or a claim 5 given in any 1 term into the case of the rechargeable battery use system concerned etc.

[0011] According to this invention, unification of a rechargeable battery, a rechargeable battery system, and a rechargeable battery use system is attained, and miniaturization and lightweight-ization are attained.

[0012]

[Embodiments of the Invention] Hereafter, the form of operation of this invention is explained with reference to a drawing. Drawing 1 is drawing showing the rechargeable battery system of one example by this invention. Drawing 2 is drawing showing the circuit pattern of one example for constituting the rechargeable battery system of drawing 1 . Drawing 3 is drawing showing the rechargeable battery of one example by this invention. It explains from the design procedure shown by drawing 1 - drawing 3 about this invention.

[0013] The only for[consistency]-ized design (unification design) of the rechargeable battery and rechargeable battery system in a rechargeable battery use system, and its periphery is performed as follows. First, in the procedure shown in drawing 1 (a), the case 1 as some sheathing cases of a rechargeable battery use system is selected as parts which have the space where a rechargeable battery system may be equipped. And the configuration of a substrate 2 of carrying a rechargeable battery system is determined from the size configuration of this case 1. A substrate 2 is an attachment object (whole) for carrying two or more unit cells 4 as a rechargeable battery of a piece, and forming a rechargeable battery system.

[0014] Next, in the procedure shown in drawing 1 (b), the size size of the unit cell 4 as shown in drawing 3 is determined. The size of each unit cell 4 is designed from the size configuration of a case 1. For example, in being the case of a complicated configuration, as for the size of a unit cell, those who used the small thing do not have the gap with the configuration of a substrate 2. Since high (it is easy to be space efficiency) arrangement of packing density can be performed, it can be said that it is desirable. Moreover, judging from the configuration of a substrate 2, it asks for the size of a unit cell by calculation so that the useless arrangement which is not may be attained to the arrangement space of the unit cell 4. That is, the size of the unit cell 4 is computed so that the energy density per unit area of "the group cell as a rechargeable battery system" may serve as the maximum.

[0015] Furthermore, the thickness of the unit cell 4 is determined from the capacity which a rechargeable battery use system needs. And when the thickness of the unit cell 4 by which the energy density per unit volume of a group cell serves as the maximum is computed and a big gap arises between the calculation thickness from this energy density, and the calculation thickness from the aforementioned capacity, the group cell as for example, a rechargeable battery system is designed in the structure which carries out laminating arrangement at a bilayer.

[0016] Furthermore, in the procedure shown in drawing 1 (b), since two or more unit cells 4 are carried in a substrate 2, each circuit pattern 3 is set as two or more partitions tidily divided into the predetermined size according to the size configuration of this unit cell 4. That is, a substrate 2 is 2 sets of positive-electrode terminals and the negative-electrode terminal (the positive-electrode terminal 9 for in-series, the negative-electrode terminal 10 for in-series, the positive-electrode terminal 11 for parallel, negative-electrode terminal 12 for parallel) which the unit cell 4 has as shown in drawing 2 . The contact for connecting electrically (the contact 5 for in-series, contact 6 for parallel), It has two or more circuit patterns 3 which consist of wiring for using as "the in-series power supply which connected the unit cell 4 in series based on the circuit design of a rechargeable battery use system, or a parallel power supply connected in parallel."

[0017] If it puts in another way, to two or more partitions tidily divided into the substrate 2 at the predetermined size according to the size configuration of a rechargeable battery Each circuit pattern with which the wiring for in-series and the wiring for parallel which were arranged in each positive-electrode terminal and each negative-electrode terminal from a series connection, the contact for in-series for carrying out parallel connection and the contact for parallel, and each of this contact were arranged, and adjoining these wiring for in-series and these wiring for parallel were connected is formed in a front face. Therefore, each unit cell 4 and each circuit pattern 3 correspond, and are set up. However, it is good even if it is not necessarily the relation of 1 to 1.

[0018] As the wiring for the above-mentioned cell power supplies is shown in drawing 2 , it consists of the wiring 18 for in-series for connecting each unit cell 4 in series through the contact 5 for in-series, wiring 19 for parallel for connecting each unit cell 4 in parallel through the contact 6 for parallel, and a signal line 8 for carrying out the monitor of the voltage of the internal circuitry of the unit cell 4, i.e., the voltage of each unit cell 4, and each is shielded. And voltage information etc. is transmitted to the security circuit (not shown) prepared in order to prevent a surcharge and an overdischarge from this signal line 8. Furthermore, the current collection circuit (not shown) which gather the power supply of the unit cell 4 connected in series or in parallel is set to the periphery edge of a substrate 2 if needed.

[0019] If the above is summarized and it will be in charge of arrangement of the unit cell to a substrate, one partition of the circuit pattern which asked for the energy density per unit area and the size of the unit cell which makes the energy density per unit volume a row at the maximum using the design technique (simulation), such as CAD, and was tidily divided into the predetermined size according to the size configuration of this unit cell is decided. Moreover, improvement in an energy density is aimed at by considering as the rechargeable battery system of the structure which carried out the multilayer laminating of the unit cell of the structure in which a laminating is possible to the substrate if needed.

[0020] And in the procedure shown in drawing 1 (c) and (d), as each aforementioned contact contacts each terminal, two or more unit cells 4 are set as two or more circuit patterns 3 formed on the substrate 2, and the design of a rechargeable battery, a rechargeable battery system, and its periphery, i.e., the design of a rechargeable battery use system, is completed. By these design procedures, an extremely supple circuit design is possible, in addition the compact and lightweight system design which gave priority to the design of a system can be performed.

[0021] Furthermore, a postscript is added about the composition by this invention, and its operation. As mentioned above, to the circuit pattern 3 as shows two or more unit cells 4 to drawing 2 equipped with the wiring for serial parallels, two or more rechargeable battery systems carry out contiguity arrangement, and form a group cell. And the circuit pattern 3 formed in a substrate 2 is the positive-electrode terminal 9 for in-series of the unit cell 4 as a rechargeable battery, and the negative-electrode terminal 10 for in-series. Each is equipped with two kinds such as every two contacts 5 for in-series, and contacts 6 for parallel as a contact for connecting the positive-electrode terminal 11 for parallel, and the negative-electrode terminal 12 for parallel. Since one side constitutes an in-series power supply for the purpose of two kinds of this contact choosing a serial or parallel, since a parallel power supply is constituted, another side has composition in-series or connectable in parallel.
[0022] The combination of this serial-parallel power supply is determined by the capacity of the unit cell 4, and the power consumption of a rechargeable battery use system. That is, according to the combination of a serial parallel, a substrate 2 builds in the change means for choosing a serial-parallel power supply so that a serial parallel can be changed on a substrate 2. Although the switch 7 as a change means is formed in a substrate 2 (tooth-back side of the field where the unit cell 4 contacts) For example, it can also consider as the composition which prepares in the unit cell 4 and is changed externally.
[0023] If it is the composition prepared on a substrate 2, since the combination of a serial parallel is designed from the voltage which can respond to the combination of any serial parallels, namely, a rechargeable battery system (and rechargeable battery use system) needs, and capacity and an in-series or parallel change can be chosen on a substrate 2 after that, design flexibility improves and it can be said that it is desirable.
[0024] On the other hand, since the circuit pattern 3 is equipped with the signal line 8 as a signal-detection means for carrying out the monitor of the voltage of the unit cell 4 on a substrate 2, when current is intercepted in an instant at the time of charge, it can read the circuit voltage of the unit cell 4 at that time in this signal line 8, for example. That is, a circuit voltage signal is transmitted and used for a control computer (not shown).
[0025] For example, in a control computer, the charge state of the unit cell 4 can be grasped and mapped from the circuit voltage signal of each unit cell 4. Moreover, the wiring circuit on the circuit pattern 3 is although it becomes complicated. "An unusual unit cell" is detected by the circuit voltage signal and the control computer. Only this unusual unit cell is also separable from the power circuit of an in-series power supply or a parallel power supply.
[0026] Furthermore, it can also have a security circuit as a safeguard for the FET interception for preventing overcharge or an overdischarge in a substrate 2. In this case, if it has one security circuit for every (every cell block) predetermined number of the unit cell 4 and a circuit voltage signal is summarized for every cell block, since a signal line 8 will be summarized to one for every block, it can connect to miniaturization of a rechargeable battery system (and rechargeable battery use system).
[0027] In a place Rechargeable battery shown in this example, Positive-electrode terminal 9 for in-series, It is the unit cell which has 4 of 2 sets of positive-electrode terminals, and a negative-electrode terminal terminals which have the negative-electrode terminal 10 for in-series, the positive-electrode terminal 11 for parallel, and the negative-electrode terminal 12 for parallel, and which can respond to an in-series power supply and a parallel power supply on the same receipt object. If it puts in another way, the example which adopted "4 Unit cell of terminal structure" which has 4 of 2 sets of positive-electrode terminals and a negative-electrode terminal terminals which enable change correspondence to an in-series power supply or a parallel power supply on the same receipt object (the same cell) is shown by this example. Although this is adopted with the switch 7 as a change means and improves design flexibility as mentioned above, it is good also in the combination of the unit cell 4 as a rechargeable battery and substrate 2 which there is no change means and consist of 2 of a positive-electrode terminal and a negative-electrode terminal terminals currently generally used, of course.
[0028] That is, although the size configuration of a unit cell is determined in this example based on the size configuration of the cell receipt permission space which a case etc. has, this determination size configuration is not necessarily connected with manufacture of an exclusive unit cell, and the general-purpose unit cell of currently possessed may be used. Drawing 4 - drawing 5 explain the correspondence in such a case.
[0029] Drawing 4 is drawing showing the circuit pattern of other examples by this invention. Two or more rechargeable batteries are installed and the circuit pattern which adjoins since the group cell of the in-series power supply as a rechargeable battery system is constituted is shown. Drawing 5 is drawing showing the circuit pattern of another example by this invention. The circuit pattern which adjoins since the group cell of the parallel power supply as a rechargeable battery system is constituted is shown.
[0030] Drawing 4 shows adjoining circuit pattern 3a and adjoining circuit pattern 3b (part) of each circuit pattern 3 for in-series power supplies. Both the circuit patterns 3a and 3b have the signal lines 8a and 8b as a signal-detection means which detect the electrical signal of a rechargeable battery. Although signal-line 8a has connected with contact 5a for in-series, signal-line 8b is not connected to contact 5b for in-series, but signal-line 8b is wiring which transmits the electrical signal detected by circuit pattern 3a. That is, it is the case where an electrical signal is detected for every (every cell block) unit cell of the predetermined number. In addition, although congestion of the signal-line circuit on a circuit pattern is carried out, it is possible to increase the unit cell number which detects an electrical signal.
[0031] Moreover, in drawing 5 , circuit pattern 3c and circuit pattern 3d which the part of each circuit patterns 3 for parallel power supplies adjoins are shown. Although circuit pattern 3c does not have the signal line 8, it has the signal line 8 circuit pattern 3d. In the case of a parallel power supply, an electrical signal is detected for every cell block as such composition. Using the above circuit patterns 3, the group cell of an in-series power supply or a parallel power supply can be constituted, and it succeeds in the use about the general-purpose unit cell which consists of 2 of a positive-electrode terminal and a negative-electrode terminal terminals.
[0032] It will be as follows if the above is summarized. That is, it sets to the heat source which has the feature of this invention, and the capacity below more than 0.5 (Wh) - 50 (kWh), power, a control circuit, a drive circuit, LSI and IC, and the rechargeable battery use system that includes at least one or two or more of such combination among display devices, and is to rechargeable battery use systems (case etc.) about a rechargeable battery and a rechargeable battery system. It is in the point to unify (exclusive-use-izing). Moreover, the rechargeable battery use system by this invention is also in the point which can unify a case and a rechargeable battery system (included rechargeable battery) easily appropriately, even if a case is a complicated size configuration.
[0033] And since the space (cell receipt permission space) as for which the case (or the part or the interior of a case of a case) is vacant with this invention by making the case of a rechargeable battery use system, a rechargeable battery, and a rechargeable battery system unify can be used effectively, miniaturization and lightweight-izing of a rechargeable battery use system are attained. In addition, the capacitor range below more than 0.5 (Wh) - 50 (kWh) is because the needs of a space deployment of the object product as a rechargeable battery use system of this range are high. In addition, the cell receipt permission space inside a part of above-mentioned case, case, or a case "is called

a case etc."
[0034] Moreover, the rechargeable battery system by this invention is applied to at least one or two or more of such combination among a liquid crystal display, a multilayer-interconnection substrate, a PCMCIA card (PC card), a voice card, a modem, a cellular phone, FAX, IC for cells, an electric vehicle, an elevator, a train, and an emergency power source. Furthermore, in the rechargeable battery system to which two or more unit cells were connected, and the rechargeable battery use system using this, this substrate by which this unit cell is arranged has the almost same size configuration as the case of a rechargeable battery use system etc., and is united with this case etc.
[0035] Furthermore, in the rechargeable battery system to which two or more unit cells were connected, and the rechargeable battery use system using this, this unit cell is installed on the substrate which built in the change means which changes the serial between these unit cells, or parallel. Namely, in the rechargeable battery system by which two or more unit cells were connected on the substrate, and the rechargeable battery use system using this, it has two kinds of positive-electrode terminals and the negative-electrode terminal for supposing that correspondence to two kinds of power supplies, an in-series power supply and a parallel power supply, is possible for this unit cell, and a change to an in-series power supply or a parallel power supply is possible for a substrate by choosing either of these two kinds.
[0036] Or this substrate has a signal line as a signal-detection means for detecting the circuit voltage of a unit cell further again in the rechargeable battery system by which two or more unit cells were connected on the substrate, and the rechargeable battery use system using this, overcharge **** has the safeguard for preventing an overdischarge using the electrical signal from this signal-detection means.
[0037]
[Example] Furthermore, it explains from the example which carried out manufacture implementation concretely according to the procedure shown in above-mentioned drawing 1 - drawing 3 about the rechargeable battery, rechargeable battery system, and rechargeable battery use system by this invention.
[0038] (Example 1) In the procedure shown in drawing 1 (a), the case 1 of the same size was mostly produced with the size of a 5 inches liquid crystal panel for the rechargeable battery use system which carried the rechargeable battery system of 20 (Wh) capacity in the background of a 5 inches liquid crystal panel. This case 1 becomes a part [the sheathing case of a rechargeable battery use system]. And the substrate 2 of the almost same size configuration as a case 1 is produced, and a simulation to which the energy density per unit volume serves as the maximum from the size configuration of a substrate 2 is performed. The size of "the unit cell 4 as a rechargeable battery" was determined. And the unit cell 4 of this size was manufactured to exclusive use.
[0039] In the procedure shown in drawing 1 (b), the circuit pattern 3 was really formed in each part which divided the substrate 2 tidily in the shape of a mesh, and divided it based on the size of the unit cell 4 obtained in the simulation. In addition, it is good even if it carries out fixing formation of the circuit pattern 3 of another object at a substrate 2. Drawing 2 is also the enlarged view of the circuit pattern 3. There are a contact 5 for in-series and a contact 6 for parallel, the wiring 18 for in-series and the wiring 19 for parallel are connected to each contacts 5 and 6, and the signal line 8 for measuring circuit voltage is also arranged in the front-face side (namely, front-face side of a substrate 2) in which the circuit pattern 3 was formed.
[0040] And it is although not illustrated. It connects in series [each wiring 18 of each adjoining circuit pattern 3, and 19 comrades], or in parallel, and the group cell of an in-series power supply or a parallel power supply is constituted. On the other hand, the switch 7 of the slide formula for carrying out the selection opening and closing of a contact 5 or the contact 6 is attached in the rear-face side (namely, rear-face side of a substrate 2) of the circuit pattern 3.
[0041] In the procedure shown in drawing 1 (c), arrangement fixation of the unit cell 4 was carried out at the substrate 2. Drawing 3 is also structural drawing of "the unit cell 4 as a rechargeable battery of one example by this invention." By the unit cell 4, the positive-electrode terminal 9 for in-series and the negative-electrode terminal 10 for in-series, and the positive-electrode terminal 11 for parallel and the negative-electrode terminal 12 for parallel are prepared in the position corresponding to the contact 5 for in-series and the contact 6 for parallel of the circuit pattern 3 of the front face of the unit cell 4 by which the unit cell 4 contacts the circuit pattern 3. Therefore, as the positive-electrode terminal 9 for in-series and the negative-electrode terminal 10 for in-series contact the contact 5 for in-series and the positive-electrode terminal 11 for parallel and the negative-electrode terminal 12 for parallel contact the contact 6 for parallel, each unit cell 4 is fixed to each circuit pattern 3 formed in the substrate 2, and the group cell of an in-series power supply or a parallel power supply is constituted. Moreover, laminating fixation of the unit cell 4 formed in the laminated-structure type if needed is carried out.
[0042] In the procedure shown in drawing 1 (d), fixing loading of the unit cell 4 of the number corresponding to two or more circuit patterns 3 was carried out at each circuit pattern 3 formed on the substrate 2, and the rechargeable battery system was completed. Therefore, it can be said that the rechargeable battery system of one example by this invention consists of a substrate 2 which has two or more circuit patterns 3, and two or more unit cells 4 which carried out fixing loading at this circuit pattern 3.
[0043] In addition, although it is **** which carries out print formation of two or more circuit patterns 3 at the direct case 1 without using a substrate 2, it can say that it is more desirable to prepare and use the substrate 2 used as another object in a case 1 from points, such as intensity of installation of a switch 7 and a rechargeable battery system, and reliability or the assembly nature of a rechargeable battery use system. If the circuit pattern 3 is formed in the direct case 1, the switch 7 of a change needs to consider the switch 7, such as preparing in the unit cell 4 side, as another setup, for example.
[0044] Thus, the manufactured case 1 with a rechargeable battery system is installed in the background of a 5 inches liquid crystal panel, and it unifies, and is the sheathing case of a rechargeable battery use system. (for example, lid case) It completed by carrying out. The size of "the liquid crystal display as a rechargeable battery use system" in the case of this example is as small as 77.5 (cm3). Thickness was as thin as 1 (cm). And the weight was as lightweight as 50 (g). Moreover, the intensity by the breakdown test was 35 (kgf/cm2).
[0045] (Example 1 of comparison) into a 5 inches "liquid crystal display" system, capacity uses five cylindrical cells as a general-purpose unit cell of 18650 sizes by 7.2 (Wh) -- the cell pack as a rechargeable battery system of 21.6 (Wh) capacity was produced The size of the liquid crystal display in this case was as large as 310 (cm3), and its thickness was as thick as 4 (cm). A weight is as heavy as 55 (g). Moreover, since the center of gravity inclined toward the cell pack twist, portability was bad. In addition, the general-purpose unit cell has pointed out the unit cell which gives versatility and the maker only for cells is manufacturing so much.
[0046] (Example 2 of comparison) inside of 5 inches a "liquid crystal display" capacity uses 12 flexible cells as a general-purpose unit cell of 1.8 (Wh) -- the cell pack of 21.6 (Wh) capacity was produced It was as large as the size of the liquid crystal display in this case, and 155 (cm3), and thickness was as thick as 2 (cm). Moreover, the intensity by the breakdown test was as small as 5 (kgf/cm2), and weak.
[0047]
[Effect of the Invention] According to this invention, it says [it / become possible only for consistency-izing / a rechargeable battery, a

rechargeable battery system, and a rechargeable battery use system / (unification), and] that miniaturization of rechargeable battery use systems, such as the Personal Digital Assistant using the liquid crystal display system and the liquid crystal display system, a carried type computer, a pen computer, a system that has the function of a cellular phone, an electric vehicle, an elevator, a train, and an emergency power source, and lightweight-ization are attained and is effective.

[0048] Moreover, rechargeable battery system by this invention, Since a unit cell is arranged in the substrate (included circuit pattern) of the size configuration according to the case and it unites with a case The design flexibility of doubling with the configuration of a rechargeable battery use system easily is demonstrated, and it is effective in the assembly nature of a rechargeable battery system or a rechargeable battery use system becoming simple.

[0049] And miniaturization of a rechargeable battery use system and lightweight-ization can be attained by using effectively the space which a case forms as an inclusion part of a rechargeable battery system. Furthermore, since the design in consideration of the center of gravity and the configuration of an used system can be performed, the portability of a rechargeable battery use system and the amenity are acquired.

[Translation done.]